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City and County of San Francisco
Public Utilities Commission

City Distribution Division
Capital Improvement Program
Driven by Facility Conditions

May 7, 2001

Presented by:

Karen Kubick, P.E.

Project Manager

CDD CIP Program

Purpose of Presentation

- Forces Driving the CDD Capital Improvement Program
- Review highest priority projects
  - Reservoirs and tanks
  - Pump stations
  - Pipelines and valves
  - Support facilities and projects
- Present cost and schedule information

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Desired Outcome

- Raise Awareness Regarding Urgent Need for Improvements
- Understand Construction Time Requirements and Constraints
- Motivate Action

City Distribution Division

- Operates and maintains distribution and storage system for drinking water & fire protection
- Includes 13 reservoirs, 25 tanks, 18 pump stations and 1,240 miles of water mains

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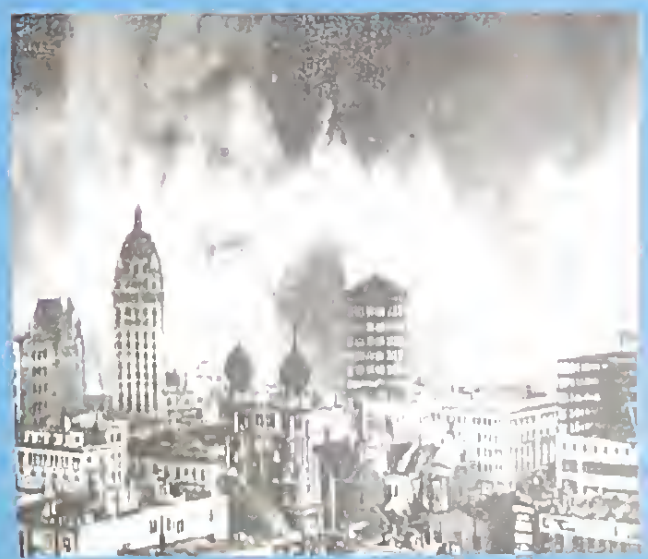
Necessity of Completing CDD Projects

- Prevent potential, imminent harm to properties and lives
- Upgrade aging facilities: 40% of reservoirs over 100 years old, three built shortly after Civil War
- Failure could severely impact water supply & fire protection in major portions of City

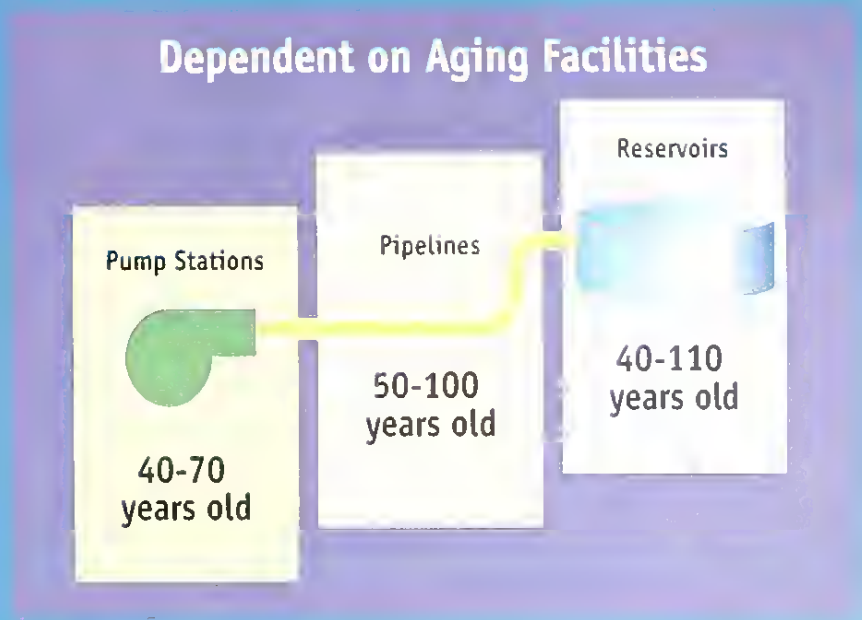


Why Act Now?

- Capital improvements deferred over years
- Operation and maintenance budget constraints
- Proactive infrastructure investment will:
  - Protect Public Safety and Property
  - Ensure system performance
  - Minimize long-term costs
  - Avoid future dramatic rate increases

Forces Driving Improvements

- Aging infrastructure
- Seismic vulnerability
- System deficiencies
- Regulatory compliance
- Operational Efficiency



Aging Infrastructure

- Pipeline and pump station failures frequently disrupt daily water service and impact local streets & neighborhoods. Potential threats exist to emergency fire protection.

29th Avenue, San Francisco 1998

Aging Infrastructure

- Tank failures and Ruptured Reservoirs could flood nearby homes, schools, and facilities

Like big rumble: *A fire department chief surveyed damage after a concrete water storage tank ruptured and flooded an Orange County neighborhood, sweeping away trees and cars.*

Tank ruptures, spawning a damaging wall of water

WESTMINSTER — A 5 million-gallon water tank ruptured early yesterday, sending a rumbling wave through the streets that swept away trees, cars and condominiums.

One firefighter suffered a broken arm when the wall of water swept him out of his fire station and washed him across a street. Five residents suffered minor injuries.

A search through the rubble of collapsed buildings determined no one was killed or trapped.

"You know how before an earthquake you heard a rumble? It was just a big rumble," said Rose Scorsone, whose family was not hurt. She said a pickup truck wound up inside her neighbor's kitchen.

"I've never been this scared before in my life," she said.

Authorities were unsure why the tank ruptured.

A giant portion of the concrete tank's wall blew out around daybreak, sending an estimated 4 million gallons of water rushing down two residential streets in this city of 82,500 people in Orange County.

"It's a mess out there. It's like Armageddon," police Lt. Bob Amren said.

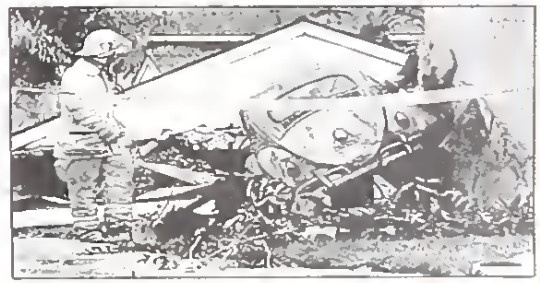
At least 50 condominiums or garages and 14 vehicles were damaged.

Hundreds of people, many in bathrobes, wandered through standing foot-deep water and debris, waiting to be allowed to return to their homes.

The worst damage was to a condominium complex.

Huge chunks of the tank wall, splintered wood and smashed cars were left in the aftermath.

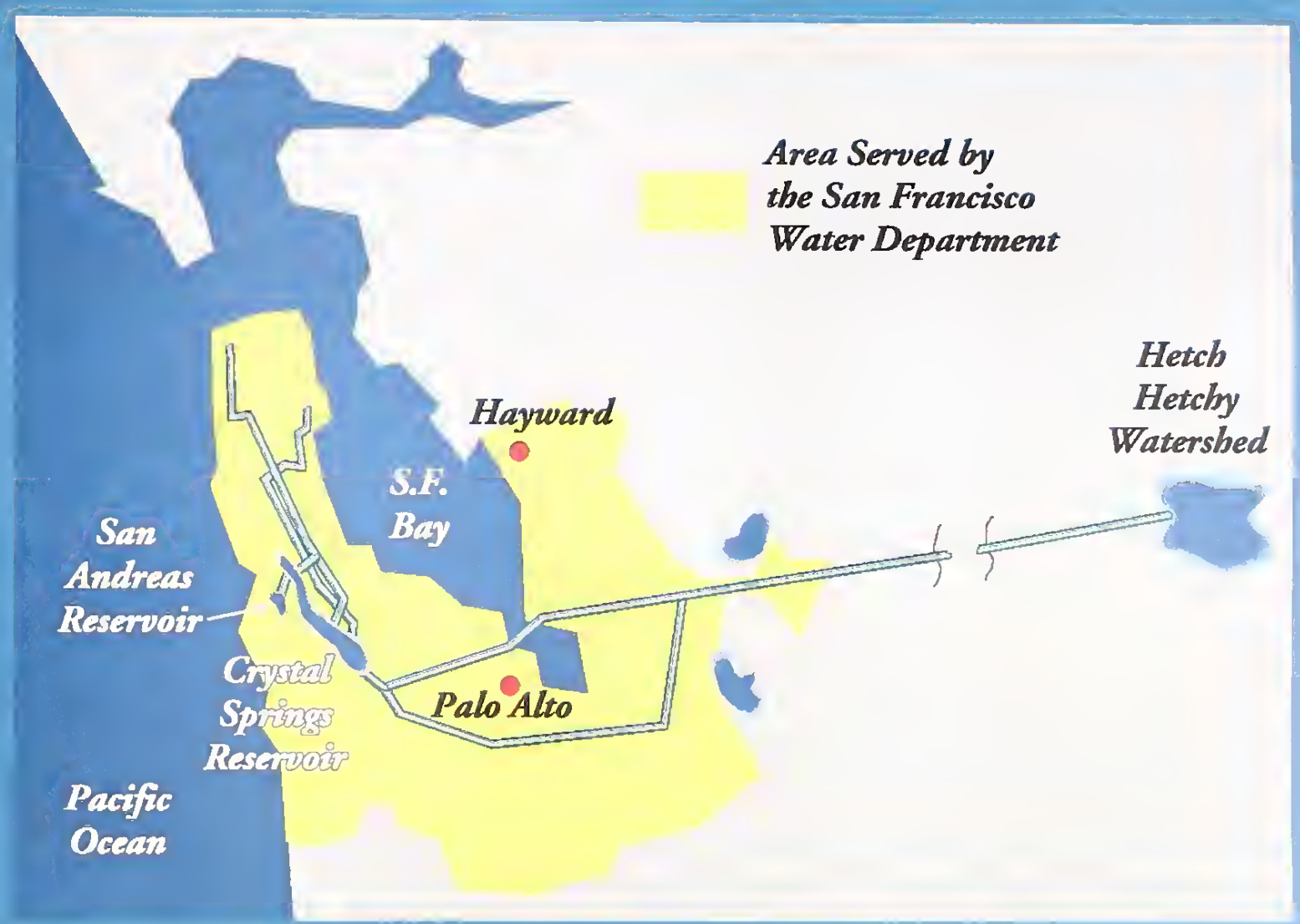
The flow apparently ruptured natural gas lines.



Washed away: *A firefighter looked at a Volkswagen Beetle that was pushed into the wall of a structure by flood waters yesterday.*

Westminster Tank, Orange Co. 1998

San Francisco's Water Supply
Hetch Hetchy Water System



Seismic Vulnerability

- CDD currently maintains 4 days of emergency storage (should increase to 7)
- A major earthquake would jeopardize the City's emergency water supply

System Deficiencies

- Facilities need upgrades to meet today's requirements for:
  - Public safety
  - Water quality
  - Water flow and pressure
  - Structural safety (current codes)
  - Facility access
  - Facility security
  - Power

Power

- Frequent Power Failures and Interrupts Disable Pump Stations
- No Reliable Back-up System

Regulatory Compliance

- Current state of facilities does not meet requirements for:
  - Uniform Building Code
  - California Division of Safety of Dams
  - Cal OSHA for Worker Safety
  - American Disability Act (ADA)
  - DOHS Title 22 Water Quality requirements
    - Conversion to Chloramination

Chloramination Impacts to CDD

- New Disinfection System
- By 2003 improvements must be made to comply with chloramination:
  - New inlet piping for reservoirs
  - Upgrades to pump stations
  - Facilities for chemical injection
- Lagging implementation could force water dumping

Operational Efficiency

- CDD improvements will facilitate systemwide efficiencies and cost savings in:
  - Equipment Reliability and Replacement
  - Reduced Chemical Demand
  - Reduced Power Usage

Review High Priority Projects and Facilities

Criteria for Prioritizing Projects

- Public safety / Security
- Possibility of Imminent failure
- Service and reliability of water supply
- Seismic deficiencies
- Reduced Outage
- State Health Dept requirements
- Need for redundancy and fire protection
- Dam Safety (DSOD)

Location of Sites

San Francisco Public Utilities Commission Capital Improvement Program - City Distribution Division

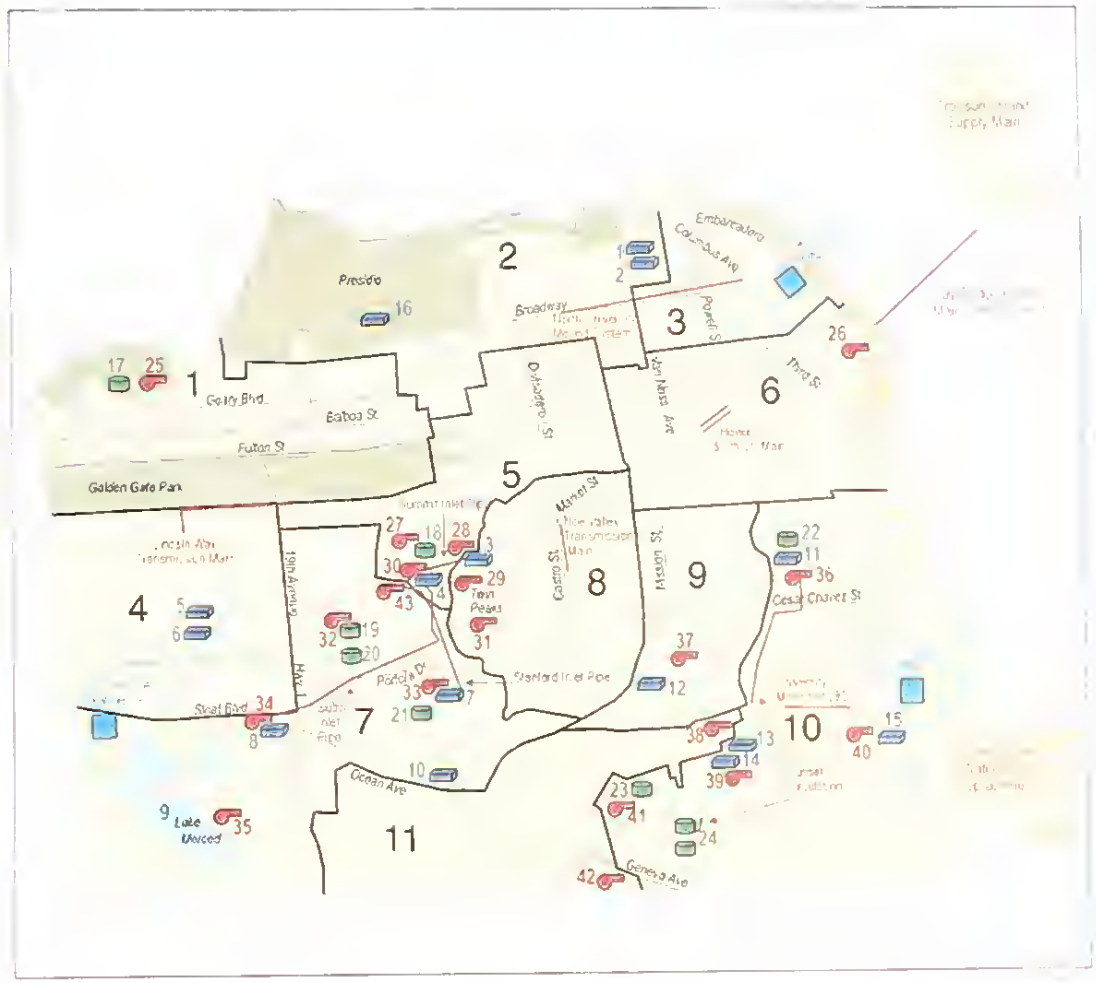
Capital Project Locations

Reservoirs	Pump Stations
1 [illegible] Reservoir	25 Lincoln Park Pump Station
2 Lombard Reservoir	26 Bay Bridge Pump Station
3 [illegible] Reservoir	27 Forest Knolls Pump Station
4 Sutro Reservoir	28 Palo Alto Pump Station
5 Sunset Reservoir North	29 Aqua Vista Pump Station
6 Sunset Reservoir South	30 Summit Pump Station
7 Stanford Heights Reservoir	31 Vista Francisco Pump Station
8 Merced Manor Reservoir	32 Forest Hill Pump Station
9 Lake Merced*	33 Mt. Davidson Pump Station
10 Fairfax Reservoir	34 Central Pump Station
11 Fairfax Heights Reservoir	35 Lake Merced Pump Station
12 College Hill Reservoir	36 Potrero Heights Pump Station
13 University Mound Reservoir North	37 Bernal Heights Pump Station
14 University Mound Reservoir South	38 Alemany Pump Station
15 Hunters Point Reservoir	39 McLaren Park Pump Station
16 Northwest Reservoir**	41 Lake St. Pump Station
	42 La Grande Pump Station
Tanks	43 Coleridge Pump Station
17 [illegible] Park Tank	
18 Forest Knolls Tank	
19 Forest Hill Steel Tank	
20 Forest Hill Concrete Tank	
21 Mt. Davidson Tank	
22 Potrero Heights Tank	
23 La Grande Tank	
24 McLaren Park Tanks	

* Emergency reservoir
** Final plans under consideration at the time of this writing

LEGEND

- Reservoir
- Tank
- Pump Station
- Pipeline
- [illegible]
- Supervisorial Districts
- [illegible]
- Inlet Pipes



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Reservoirs

- Seismic roof upgrades critical to improving reliability of CDD system
- 6 reservoir roof failures predicted in 6 to 6.5 magnitude earthquake on San Andreas Fault or 6.5 to 7 on Hayward
- Deteriorated condition threatens structural integrity and water quality
- Continued recreational uses on roof cause wear & tear, which threatens water quality

CDD Reservoirs

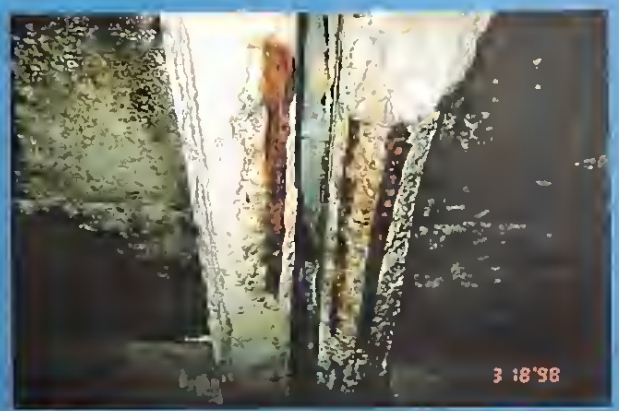
Name	Year Built	Capacity MG
Lombard Street	1860	2.7
Francisco Street	1861	2.5
College Hill	1870	13.5
University Mound N	1885	59.4
Potrero Heights	1897	1.0
University Mound S	1924	81.5
Stanford Heights	1932	12.9
Merced Manor	1936	9.5
Sunset North Basin	1938	89.4
Sutro	1952	31.4
Summit	1954	14
Sunset So. Basin	1960	87.3
Hunters Point	1973	1.0

Sunset Reservoir - North Basin (4)

- Provides 60% of water serving the City, serves eight reservoirs
- Study shows reservoir roof will collapse in minor earthquake
- Loss of basin would devastate City's water system

Sunset Reservoir - North Basin (4)

- Major issues:
  - Roof built in 1938 significant concrete damage, low strength
  - Failed expansion joint system
  - Circulation problems/water quality



Sunset Reservoir - South Basin (4)

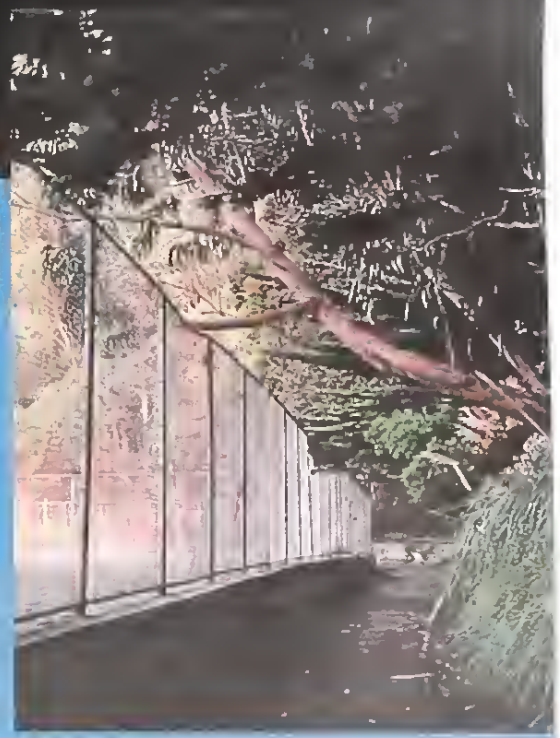
- Major issues:
  - Needs seismic upgrade
  - Roof strength very low
  - Security/Access
  - Incompatible with Recreational Use

Sutro Reservoir (7)

- Major issues:
  - Failed Expansion joints
  - Water Quality Problems due to surface usage
  - Public vandalism
  - Circulation

Sutro Reservoir (7)

- Major issues (continued)
  - Dam seepage/safety
  - Drainage & erosion
  - Upstream from playground and Fire Station

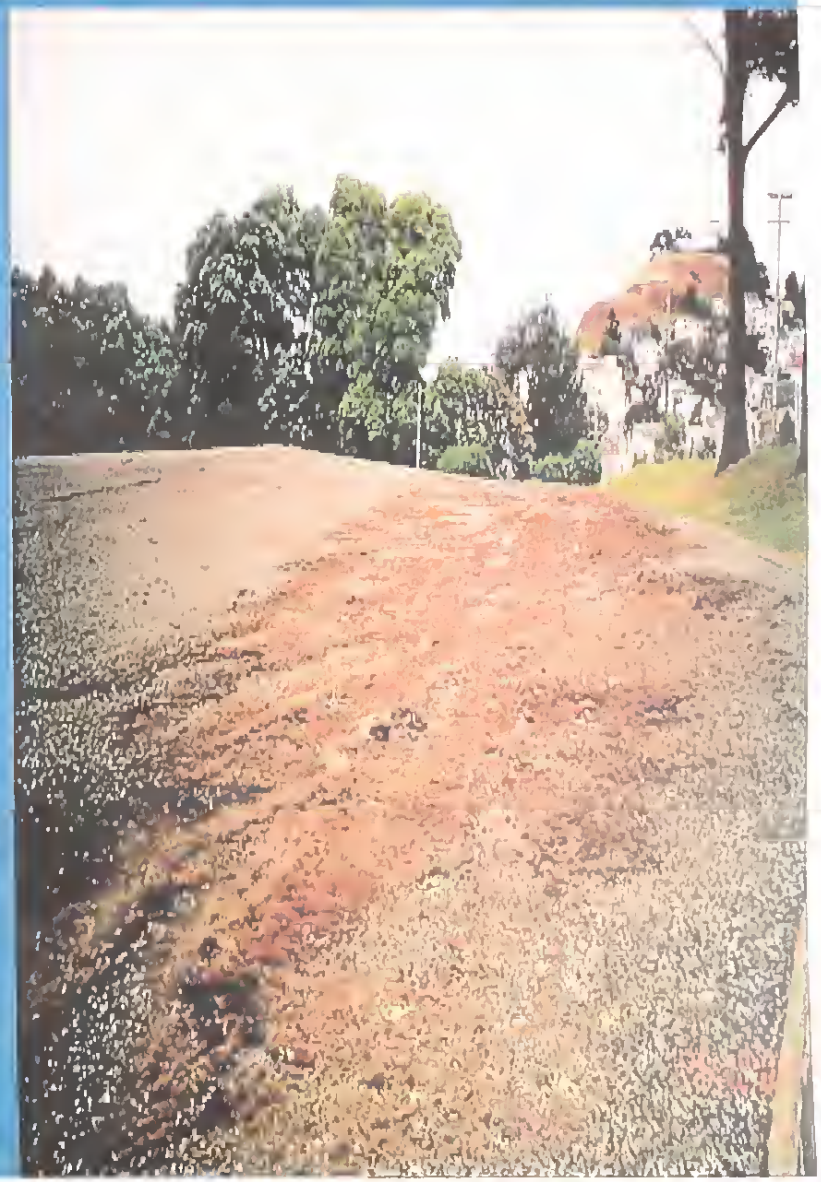


University Mound Reservoir(10)

- Major issues:
  - Cracked roof
  - Failed expansion joint system
  - Circulation/water quality problems
  - Failed liner, basin leaks
  - Embankment Issues
  - Vent System

College Hill Reservoir (9)

- Major issues:
  - Reservoir damaged during Loma Prieta; needs new roof, and seismic upgrade
  - Liner is cracked and leaking
  - Surface fissures over entire surface of roof



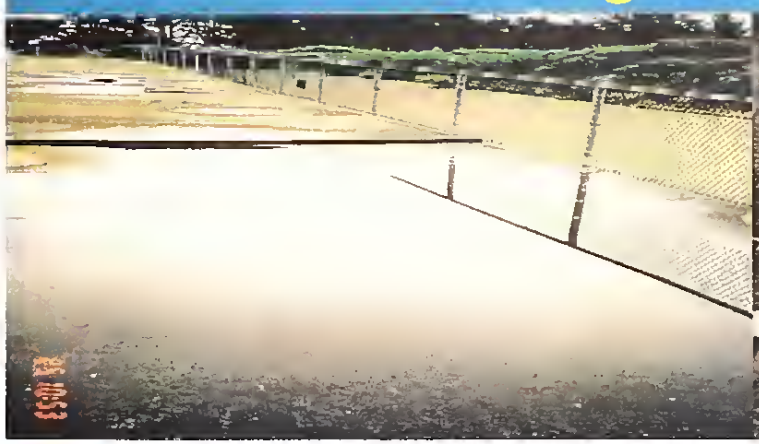
College Hill Reservoir (9)

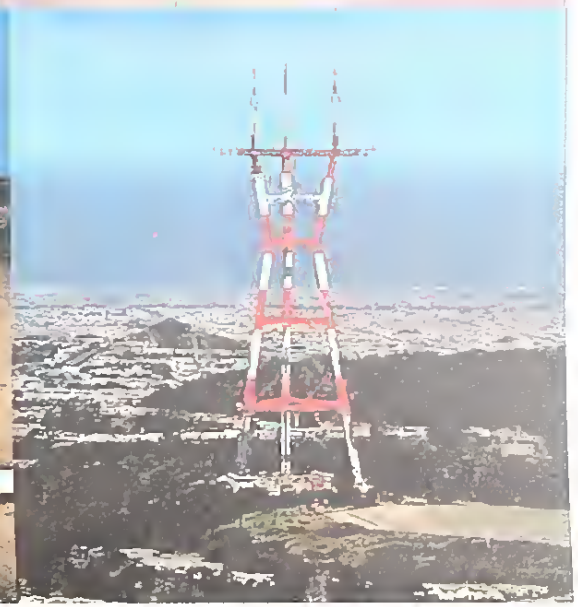
Major issues:

- –Embankment Stability, reservoir is adjacent to a children's day school and homes
- –Security perimeter fence
- -Water quality problems

Summit Reservoir (8)

- Major issues:
  - Critical for fire protection
  - Subsidence under access road
  - Seismic Upgrade
  - Circulation/water quality
  - Public concern about Sutro Tower falling on reservoir





Lombard Reservoir (2)

- Major issues:
  - Cracked roof/surface fissures
  - Surface uses impacting water quality/ Dogs
  - Corroded beams connections/cracked girders failed seismic protection
  - Embankment Movement
  - Multiple leaks
  - Drainage

Stanford Heights Reservoir (7)

- Major issues:
  - Circulation/water quality problems
  - Failed Expansion Joints
  - Needs new inlet pipe and vault
  - Close to residences
  - Security

Merced Manor Reservoir (7)

- Major issues:
  - Failed Expansion joints
  - Roof Damage, Cracks
  - Close to residences
  - Fencing and security
  - Need to limit public access & dogs on roof

Balboa Reservoir (7)

- Major issues:
  - Critical to improving reliability downtown & hydraulic relief to east side of City
  - Timing of City College expansion
  - Orientation of reservoir on site to accommodate expansion
  - Relocation of City College parking

Francisco Reservoir (2)

- Major issues:
  - Currently out of service; elevation too low to serve surrounding areas
  - Requires rebuilding taller structure due to elevation requirements
  - Collapsing roof; dry rot
  - Public safety hazard
  - Close to residences
  - Public supports rebuild to ensure open space

Potrero Heights Reservoir (10)

- Major issues:
  - Wooden roof is deteriorated/dry rot
  - Seismic Upgrade is necessary
  - Circulation and operational problems
  - Impacts Sunset circulation system

Other Reservoirs

College Hill

Sutro

Stanford Heights

Merced Manor

Sunset South

Francisco

Tanks

- Several tanks in risk of overturn during earthquake
- Circulation problems affecting water quality
- Need continued structural inspections and maintenance to avoid situations like Westminster tank failure

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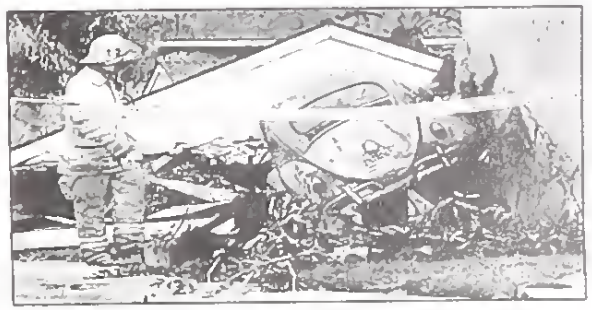


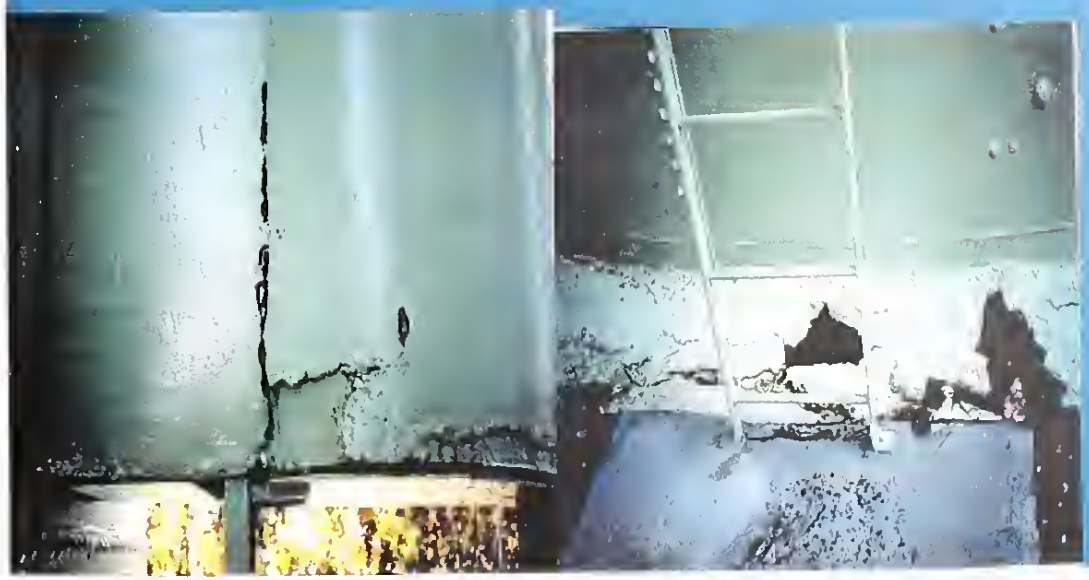
Washed away: *A firefighter looked at a Volkswagen Beetle that was pushed into the wall of a structure by flood waters yesterday.*

CDD Tanks

Name	Year Built	Type	Capacity
Lincoln Park	1924	Concrete	75,000
Forest Hill	1926	Steel	300,000
Forest Hill	1944	Concrete	300,000
Potrero Hts	1950	Steel	100,000
Mt Davidson	1953	Concrete	75,000
Le Grande	1956	Steel	300,000
Forest Knolls	1960	Steel	100,000
McLaren Park (2)	1966	Steel (2)	8,000,000

Forest Hill Tanks (7)

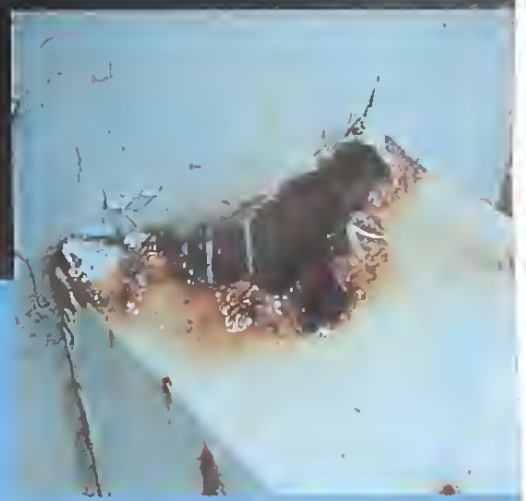
- Vulnerable to overturn
- Circulation, seismic and access problems
- Corrosion, pitting
- Multi-use site (DTIS/MUNI/SFO/Pac Bell)



Lake Merced Surge Tanks (7)

- Protect the Lake Merced Station from Surge during frequent power failures
- Corroded, not seismically anchored
- Failure will cause pump outage- supplies Sunset (4) and Sutro (5)

La Grande Tank (10)



- Major issues:
  - Corrosion pitting
  - Vulnerable to overturn and leakage
  - Directly above Homes

Other Representative Tanks

A full assessment of all the tanks is underway

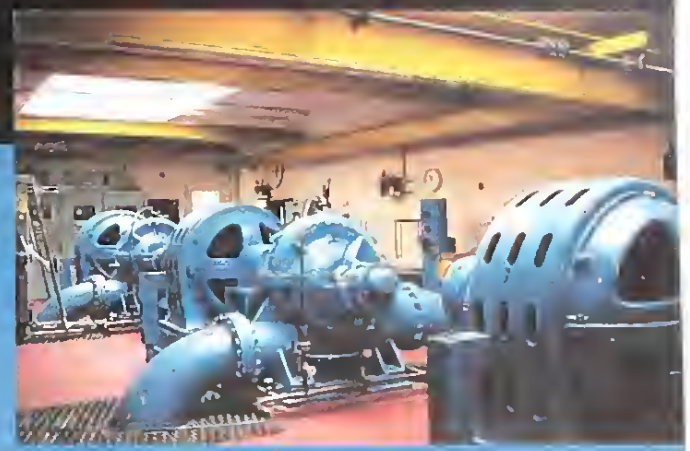
Potrero Heights Tank

Mc Laren Park Tanks

Lincoln Park Tank

CDD Pump Stations

Pump Station	Date Constructed
Central	1927
Lane Street	1930
Alemany	1931
Lincoln Park	1947
Potrero Heights	1950
Mount Davidson	1952
Lake Merced	1953
Summit	1955
Crocker Amazon	1956
Le Grande	1956
Palo Alto	1958
Forest Knolls	1960
Skyview Aqua Vista	1961
Forest Hill	1963
Vista Francisco	1964
McLaren	1967
Bay Bridge	2000
Clarendon	2001



Pump Station Deficiencies

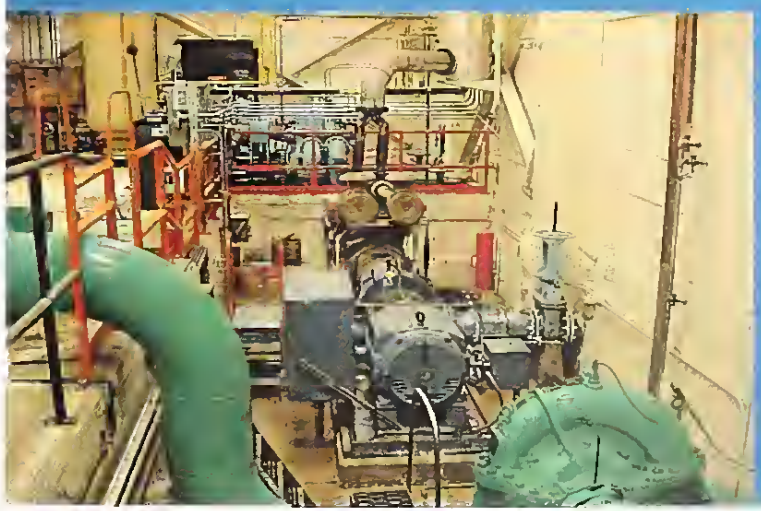
1. Emergency Power Generation
2. Equipment Reliability and Capacity
3. Structurally Seismic Anchoring
4. Security
5. Chemical Systems for Chloramination

Crocker Amazon Pump Station(11)

- Emergency Generator Installation
- Pump/Pipe Replacements
- Equipment Anchoring
- Replace Structure and Tanks

Central Pump Station (7)

- Structural Repair/Code Compliance
- Full Equipment Replacement
- Emergency Power/ Security/Fire Detection
- Chemical System
- Seismic Upgrade



Lane Street Pump Station

- Replace Structure to meet Code
- Equipment Replacement
- Emergency Power
- Security/Fire Detection

McLaren Park Pump Station

- Security/Fire Detection
- Structural Repair
- Pump/Pipe Replacements
- Emergency Generator Upgrades

Lincoln Park Pump Station (1)

- Access Improvements
- Retaining Wall Repair/Reinforcement
- Structural Repair
- Roofing
- Equipment Anchoring
- Tank Relocation
- Pump Replacement
- Security/Fire Detection

Skyview-Aquavista Pump Station(8)

- Security/Fire Detection
- Replace Structure
- New Equipment
- Anchor Tanks
- Generator Installation

Palo Alto Pump Station (5)

- Replace Structure
- Upgrade to meet Codes
- Equipment Anchoring
- Higher Capacity Pumps
- Generator Installation
- Security/Fire Detection

Summit Pump Station (7)

- Flood Zone
- Rebuild Station
- Seismic Upgrade
- Emergency Power
- Security/Fire Detection
- New Equipment

Forest Knolls Pump Station (5)

- Replace Structure to meet Codes
- New Equipment/Seismic Anchoring
- Emergency Generator Installation
- Security/Fire Detection

Mount Davidson Pump Station (7)

- Landslide Possibility
- Structural Repair
- Anchoring
- Roofing
- Pump Replacement

- Security and Fire Alarm Installation
- Cannot be taken out of service needs new backup pump station

Potrero Heights Pump Station

- Structural Repair
- Anchoring
- Pump/Pipe Replacements
- Emergency Generator Installation
- Security/Fire Detection

Vista Francisco Pump Station

- Landslide Possibility
- Structural Repair
- Anchoring
- Retaining Wall Repair
- Roofing
- Pump Replacement
- Generator Installation
- Security and Fire Alarm Installation

La Grande Pump Station

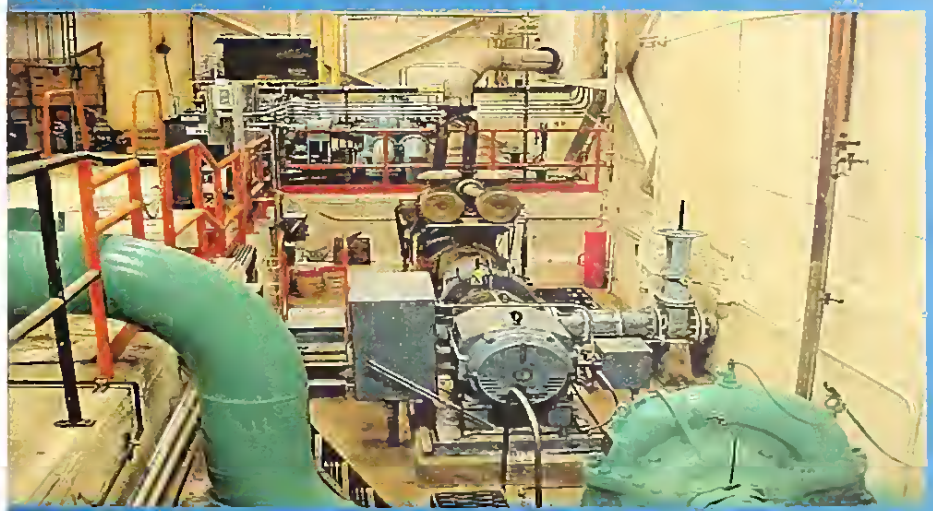
- Structural Repair
- Anchoring
- Security and Fire Alarm Installation
- Circulation Improvements
- Pump/Pipe Replacements
- Generator Installation

Forest Hill Pump Station

- Structural Repair
- Wall Reinforcement
- Emergency Generator Installation

Other Pump Stations

Mount Davidson Pump Station



Central Pump Station

Forest Hill Pump Station

Pipelines

- Replacement 8 out 1200 miles annually
- Replacement and Back-up Pipelines are Necessary for Conveyance and Fire Protection

Pipeline Failures

Pipelines

- Feeder Mains
- Main Replacement
- Transmission Pipelines
- Inlet Outlet
- Major Pipeline
  - Crosstown
  - Lincoln
  - Fulton
  - Noe Valley
  - Sunset Circulation

San Francisco Public Utilities Commission Capital Improvement Program - City Distribution Division

Capital Project Locations

Reservoirs	Pump Stations
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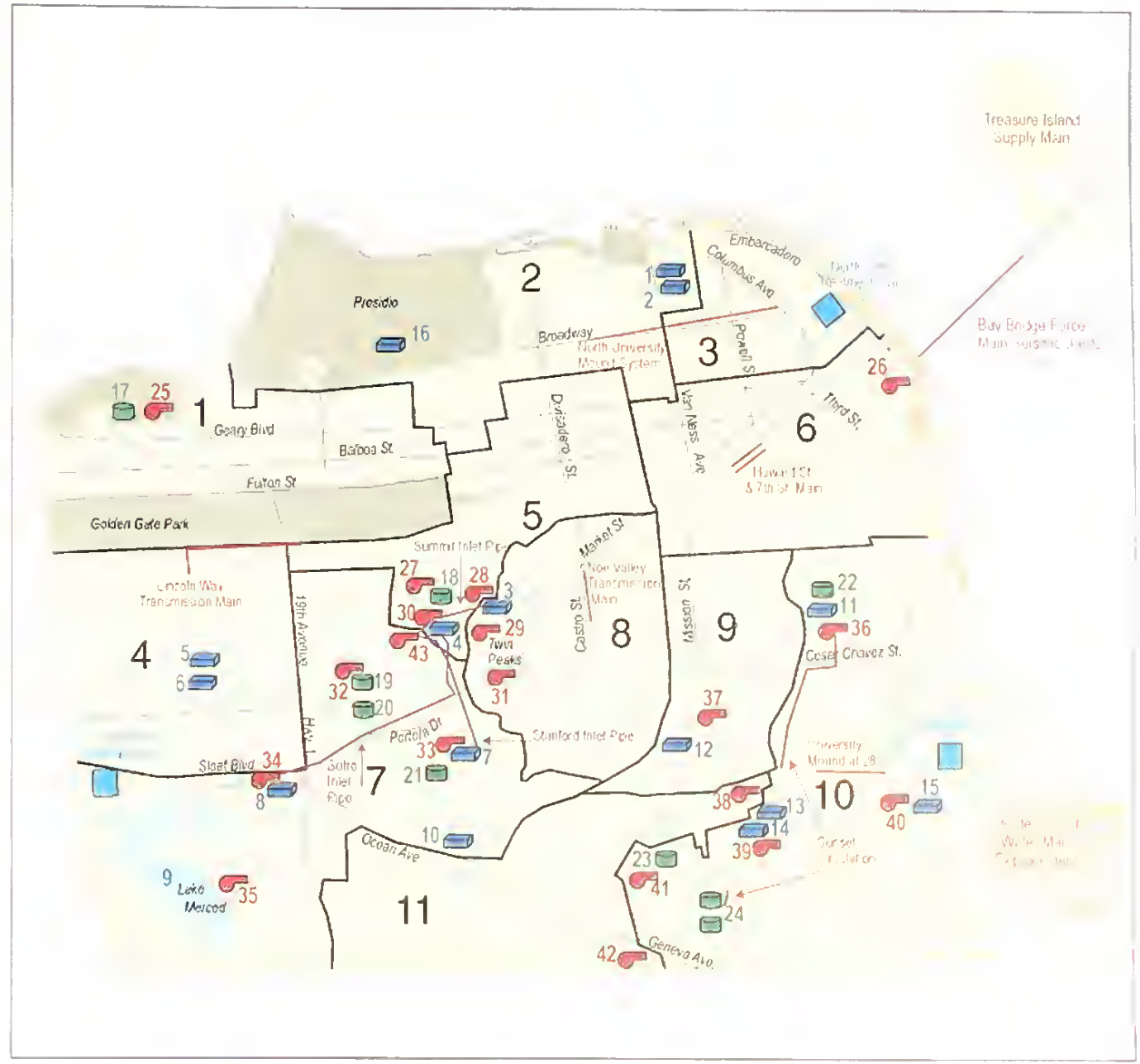
* Emergency reserve

** Four sites under consideration in the general area



LEGEND

- Reservoir
- Tank
- Pump Station
- Pipeline
- Wastewater Treatment Plant
- Supervisonal Districts
- Streets
- Inlet Pipes

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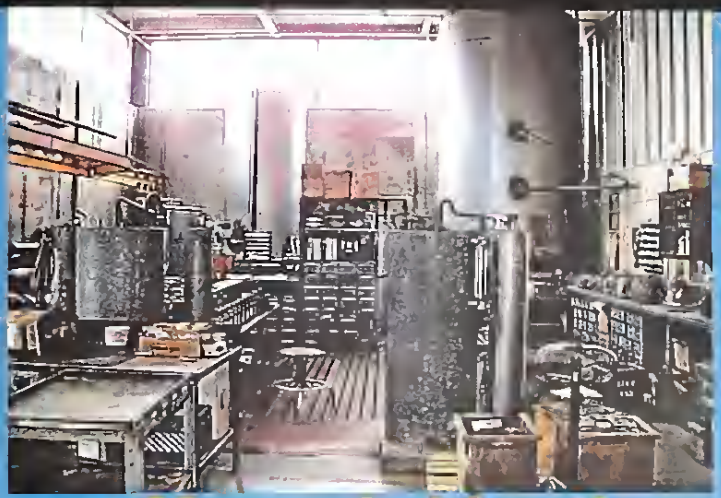
Other Projects- Out of The Box



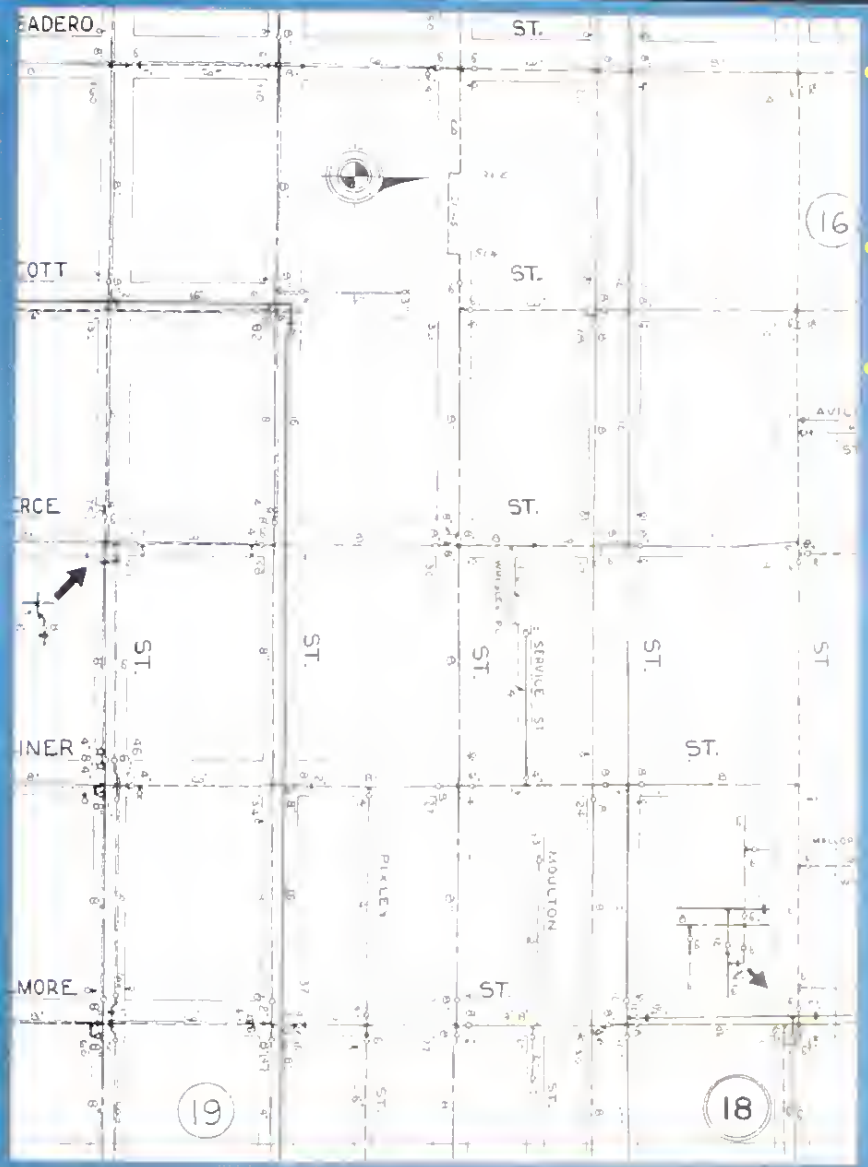
Meter Calibration

Portable Generators

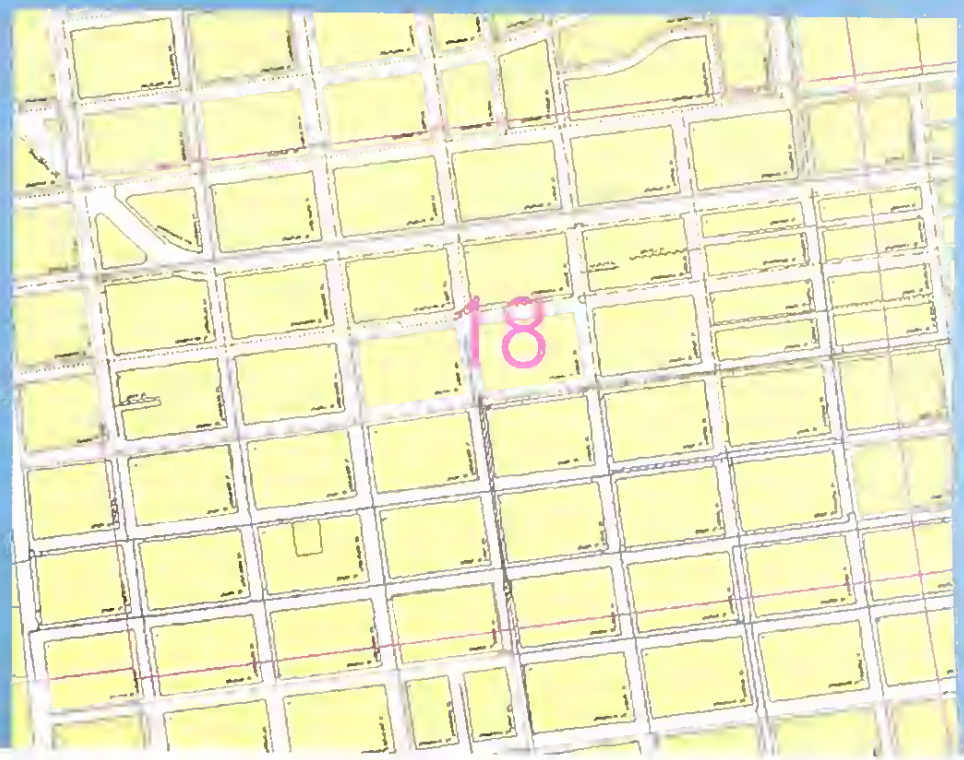
Embankment Analyses

Balboa Reservoir

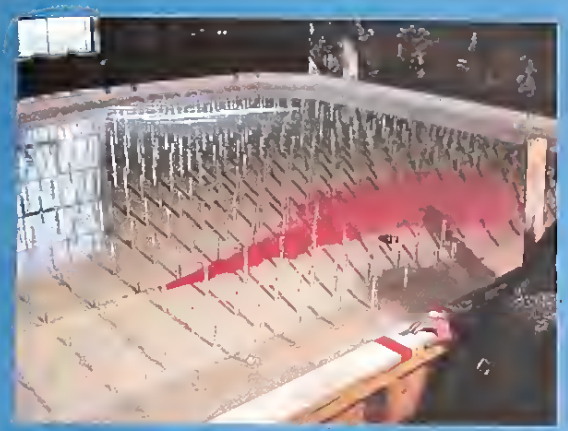
Computerized Gatebooks

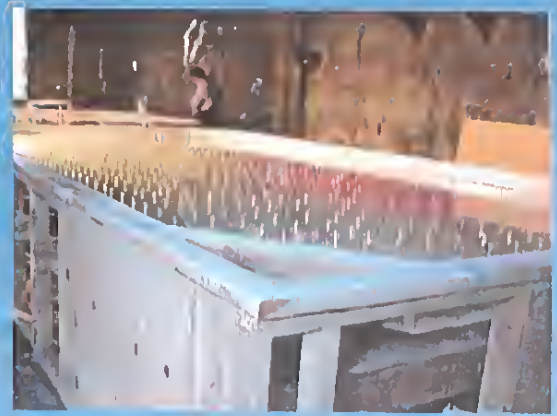


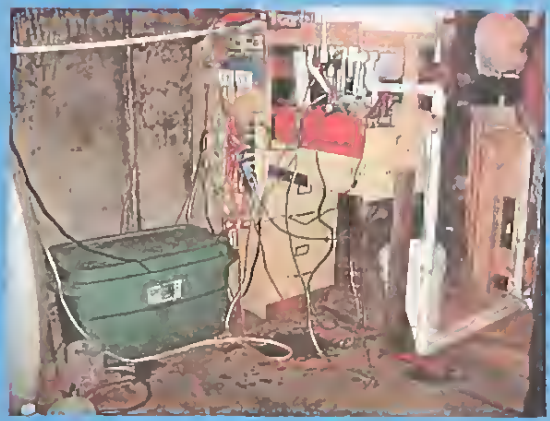
- Manual Gatebooks are currently used to track system information (200 pages, 150 detailed pages)
- Includes location & size of valves, hydrants, blow-offs, mains; indicates zones
- New computerized GIS System underway

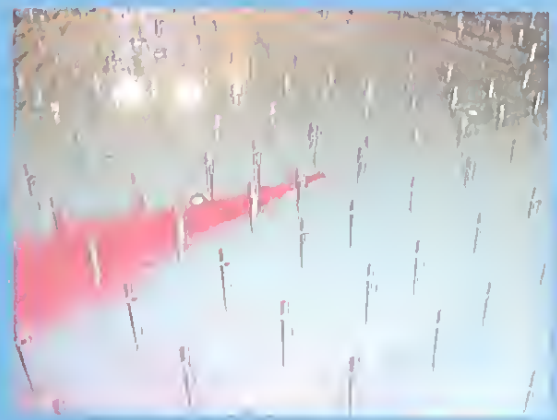


Sunset Reservoir Physical Model









CDD CIP Project Status

Project Status - Constructed

- Bay Bridge Pump Station
- University Mound Hwy 280 Twin Pipeline
- Alemany Pump Station Generator Building & Upgrades

Project Status – In Construction

- Clarendon Pump Station
- Summit Inlet Pipeline
- Stanford Heights Inlet Pipeline
- Sutro Inlet Pipeline – Phase 1
- Sunset Reservoir South Rehabilitation & Cleaning
- Sutro Reservoir Erosion & Drainage
- Forest Hill Tank Replacement
- College Hill Reservoir Seismic Upgrade
- CDD Shops Upgrade
- CDD ADA Entrance Ramp

Construction Pending

- Key Motorized Valves
- Meter & Valve Testing/Calibration Facility and Assoc. Improvements
- CDD Power Upgrade
- Sutro Reservoir Inlet Vault and Upgrades

Construction Status

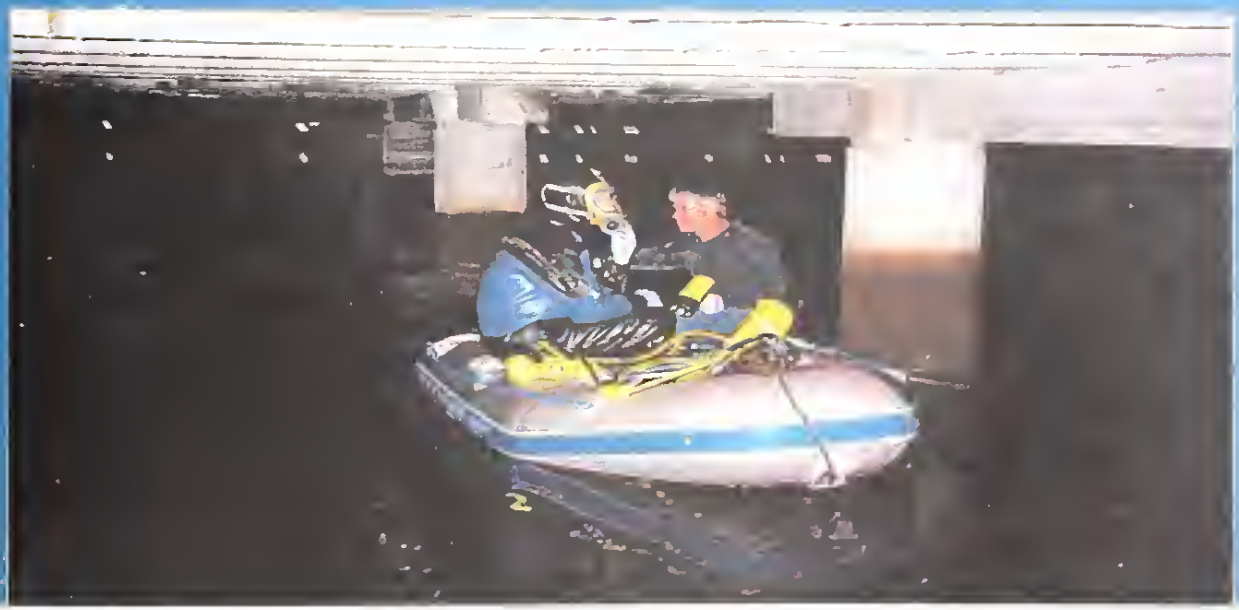
- FY 1997 - 1998 0 CIP Construction Projects
- FY 1998 - 1999 1 CIP Construction Project
- FY 1999 - 2000 10 CIP Construction Projects
- FY 2000 - 2001 13 CIP Construction Projects

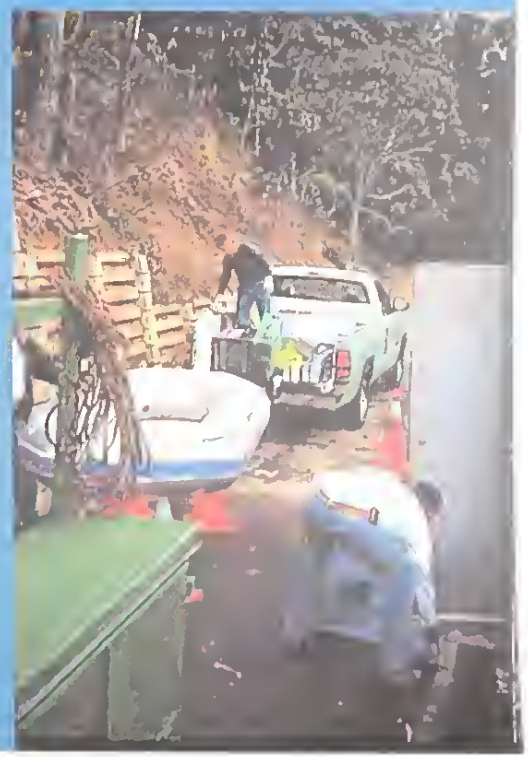
Design

- Central Pump Station Upgrade
- Sutro Inlet Pipeline Phase III
- Summit Reservoir Seismic Upgrade and Inlet Vaults
- Sunset Circulation
- Sunset North Seismic Upgrade
- University Mound South Rehabilitation & Cleaning
- Tank Assessment
- Pump Station Capital Cost
- Hydropneumatic Tank Assessment
- Sunset Reservoir Embankment Repair
- Lake Merced Surge Tank Replacement
- CDD Fire Detection

Ten Year CIP

- Has been developed based on Facility Condition and Need
- Contingent upon funding and shutdown schedule
- Total Cost $1 Billion





Funding

- Supply $180M
- Distribution Improvements $200M
- Seismic Improvements $180M
- Water Quality $35M
- Infrastructure R&R $270M
- Operations and Support $65M
- Regional Projects $125M

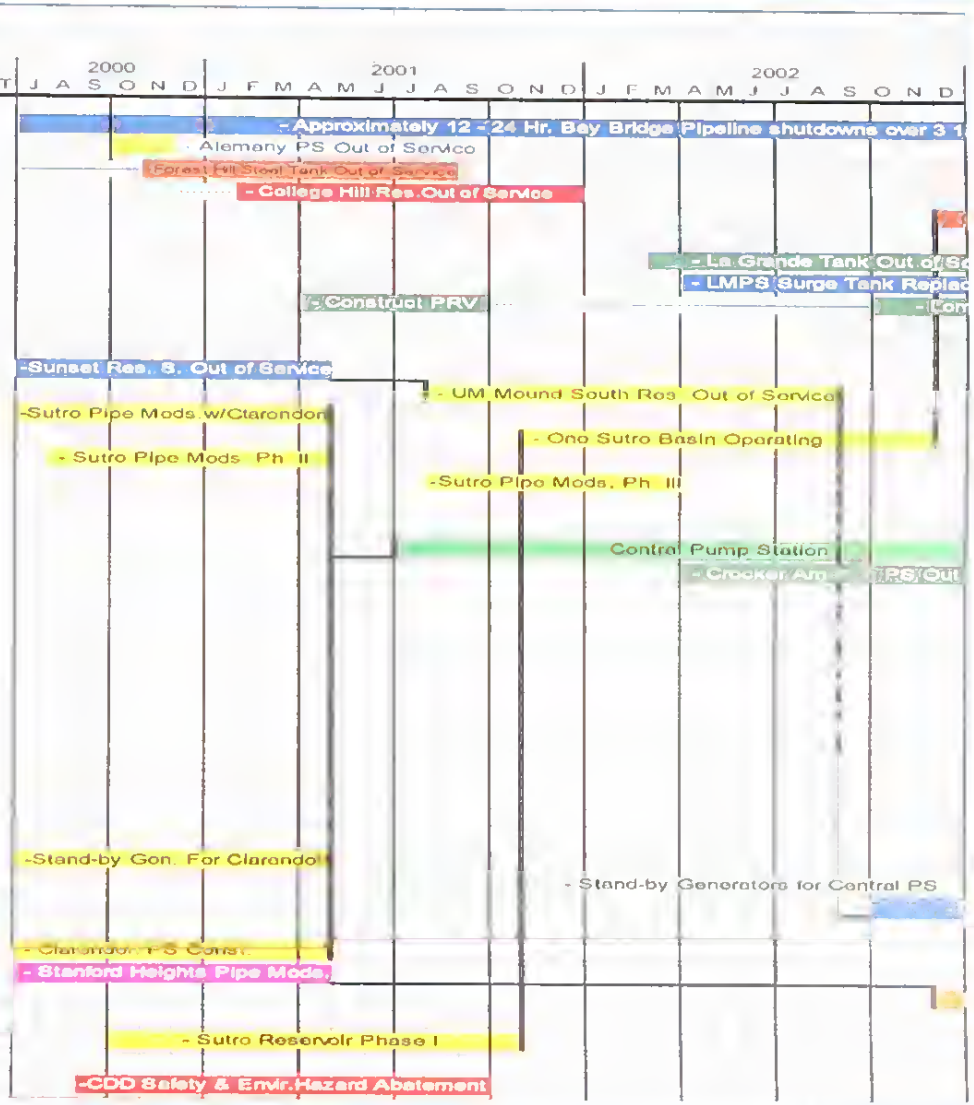
Quadrant 1 Projects

- Balboa Reservoir
- Renew Water Services
- Relocate Realign Water Service
- Mortar Line Feeder Mains
- Key Motorized and Other Critical Valves
- Water Main Extension
- Lincoln Way Transmission
- Noe Valley Transmission Main
- Crosstown Transmission Main
- Fulton @ 6th 30-inch Steel main
- Lake Merced Pump Station Master Plan / Power Upgrade
- Seismic Structural Upgrade, Reservoirs and Tanks
- Reservoir Rehabilitation
- Pump Stations
- Emergency Power for Pump Stations
- Feeder Mains --No Funding --Annual Funding for FY 01-02 Austerity

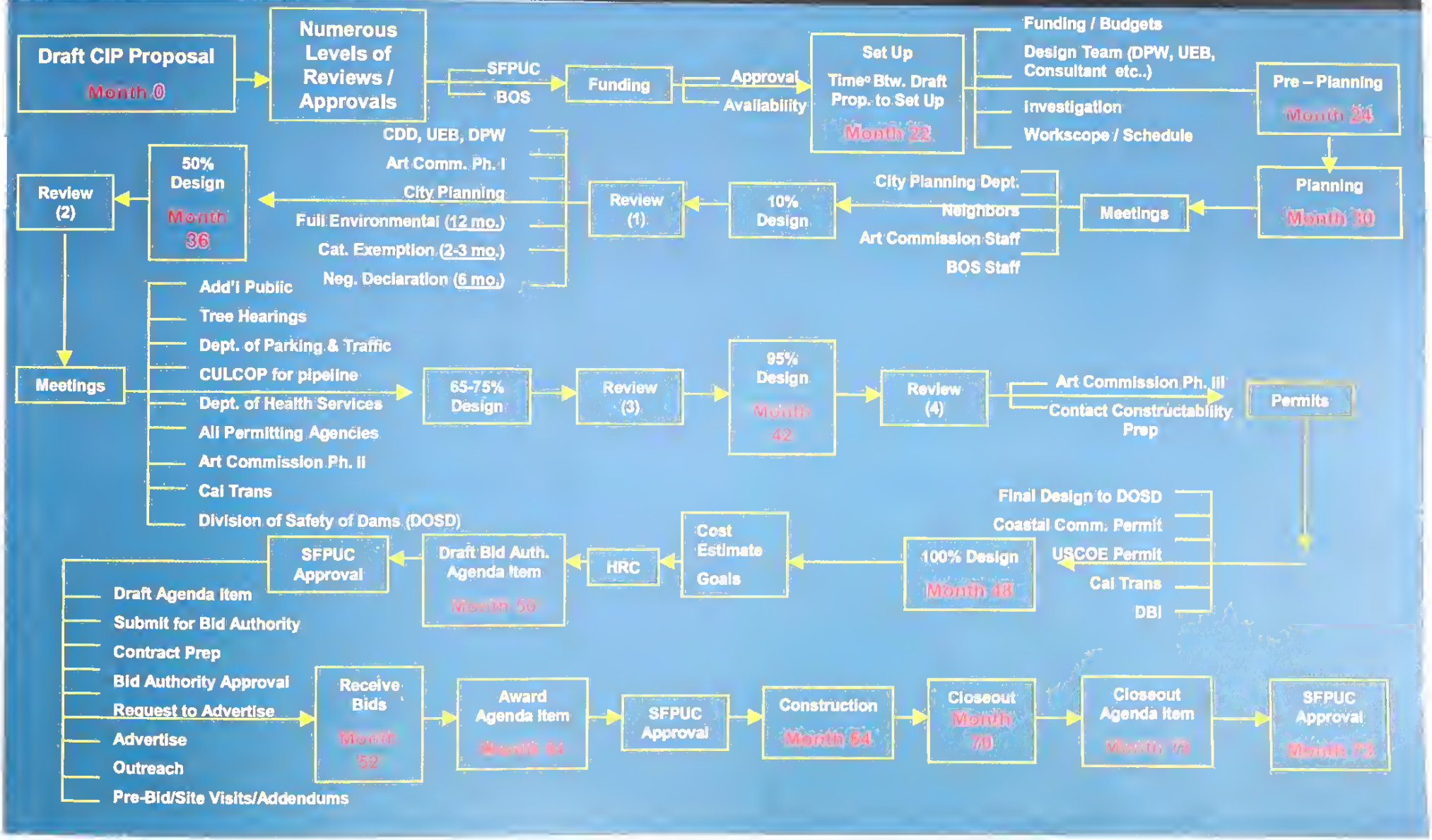
Shutdown Schedule

- CONSTRUCTION SHUTDOWN SCHEDULE THROUGH 2010

PROJECT #	PROJECT	Construction Current % CPT
Facility Shutdowns		
CUW203 2	Bay Bridge Pump Station Pipeline	5
CUW811	Rebid/Const -Alemany PS generator bldg	90
CUW624 1	Forest Hill Tank Replacement	5
CUW624 2/630	College Hill Reservoir Upgrade	0
CUW624 3/668 2	Summit Reservoir Seismic Upgrade/Inlet Vaults	0
CUW624 4	University Mound North Seismic Upgrade	0
CUW624 5	La Grande Tank	0
CUW624 8	LMPS Surge Tank Repl & Seismic Anchoring	0
CUW624 7	Lombard Reservoir Repairs	0
CUW624 various	Tanks	0
	Sunset Reservoir South Seismic Upgrade	0
CUW628 1	Sunset Res -S Basin Cleaning/Exp Joints	30
CUW628 2	University Mound-S Basin Cleaning/Exp Joints	0
CUW632 1	Sutro Reservoir, Modify I/O Ph I	90
CUW632 2	Sutro Reservoir I/O Structure (Vault)	0
CUW632 3	Sutro Reservoir, Modify I/O Ph II	0
CUW632 4	Sutro Reservoir Modify I/O Ph III	0
	Merced Manor Rehabilitation & Repair	0
CUW638	Lake Merced Pump Station Master Plan	0
CUW651 1	Central PS Upgrade	0
CUW651 #	Crocker Amazon - PS Upgrade Program	0
CUW651 #	Lane Street - PS Upgrade Prpgram	0
CUW651 #	McLaren Park - PS Upgrade Prpgram	0
CUW651 #	Lincoln Park - PS Upgrade Program	0
CUW651 #	Skyview-Aqua Vista - PS Upgrade Program	0
CUW651 #	Palo Alto - PS Upgrade Prpgram	0
CUW651 #	Summit - PS Upgrade Program	0
CUW651 #	Forest Knolls - PS Upgrade Prpgram	0
CUW651 #	Mount Davidson - PS Upgrade Program	0
CUW651 #	Potrero Heights - PS Upgrade Program	0
CUW651 #	Vista Francisco - PS Upgrade Program	0
CUW651 #	La Grande - PS Upgrade Program	0
CUW651 #	Forest Hill - PS Upgrade Program	0
CUW653 1	Stand-by Generators for Clarendon PS	60
CUW653 5	Stand-by Generators for Central PS	0
CUW654	Sunset Reservoir North	0
CUW657	Balboa Reservoir	0
CUW668	Clarendon Pump Station Construction	60
CUW668 1	Summit/Stanford Heights-Modify In/Outlet Pipe	90
[illegible]	[illegible]	0
CUW669	Fire Storage Tanks Upgrade	0
CUW672 1 & 672 3	Sutro Reservoir Phase I (Drainage Management)	10
CUW678	Lake Merced Pump Station Power Upgrade	0
CUW641	Vehicle Service Facility Equip Repl & Upgrade	10


2000
J A S O N D
2001
J F M A M J J A S O N D
2002
J F M A M J J A S O N D
- Approximately 12 -24 Hr. Bay Bridge Pipeline shutdowns over 3 1
- Alemany PS Out of Service
- College Hill Res. Out of Service
- La Grande Tank Out of Se
- LMPS Surge Tank Replac
- Construct PRV
-Sunset Res. S. Out of Service
- UM Mound South Res. Out of Service
-Sutro Pipe Mods.w/Clarendon
- Ono Sutro Basin Operating
- Sutro Pipe Mods. Ph II
-Sutro Pipe Mods. Ph III
Central Pump Station
- Crocker Am
PS Out
-Stand-by Gen. For Clarendon
- Stand-by Generators for Central PS
- Stanford Heights Pipe Mods.
- Sutro Reservoir Phase I
-CDD Safety & Envir.Hazard Abatement

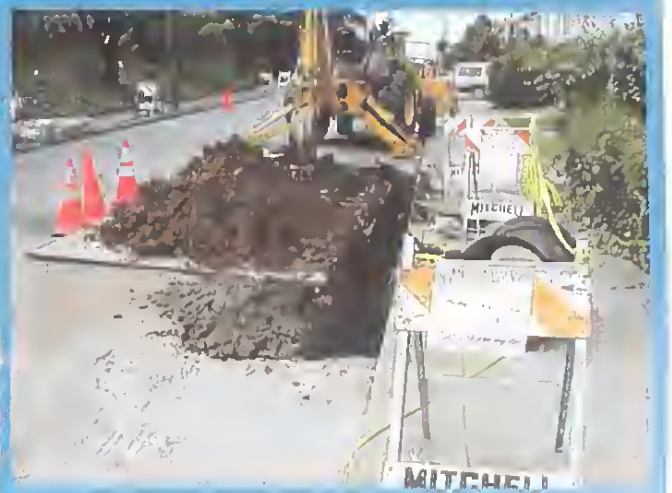
Getting a Project Completed



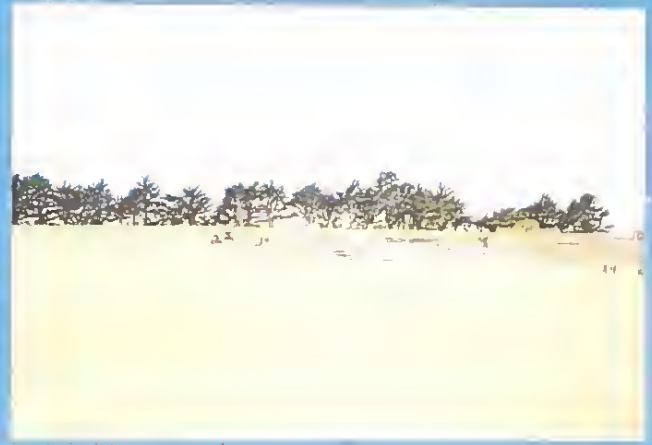
Call For Action

- A Streamline Process and Aggressive Program is necessary
- System deficiencies are critical and failures impact our citizens and economy
- Your moral and funding support is vital

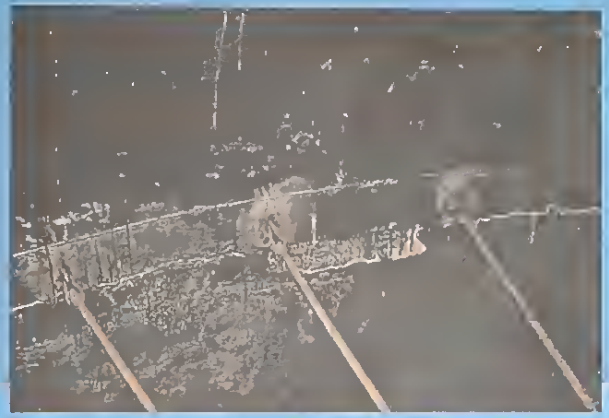
Construction Photos – Clarendon Pump Station

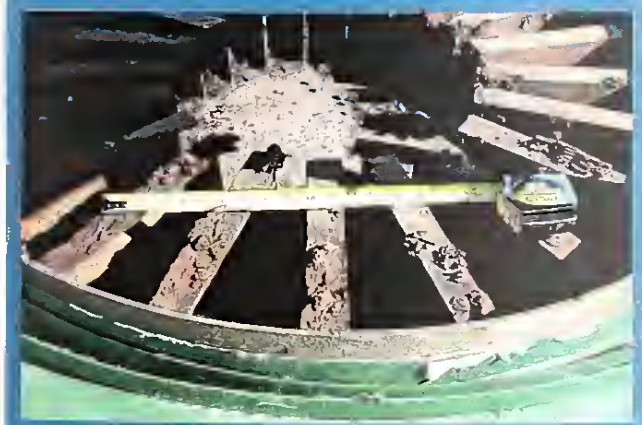


Construction Photos – Sunset South Basin Cleaning & Repair



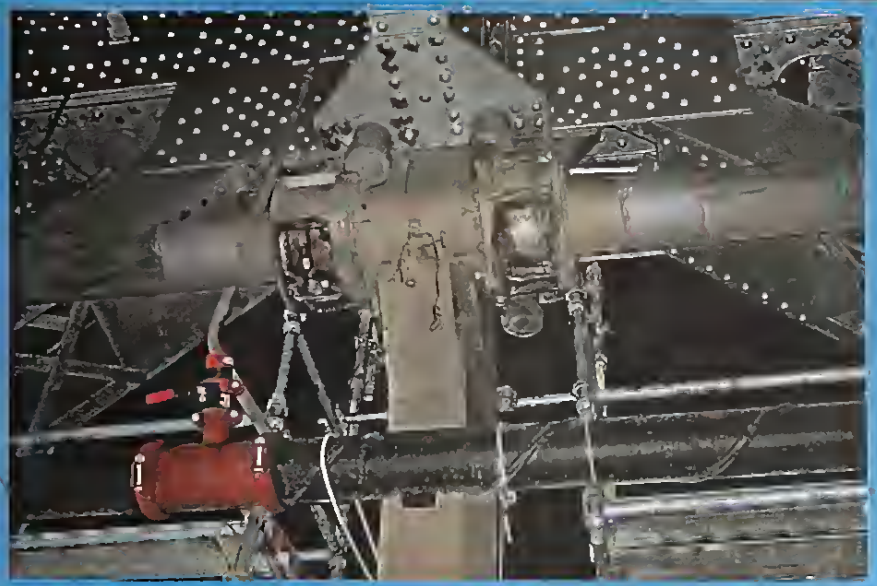
Tank Assessment Program

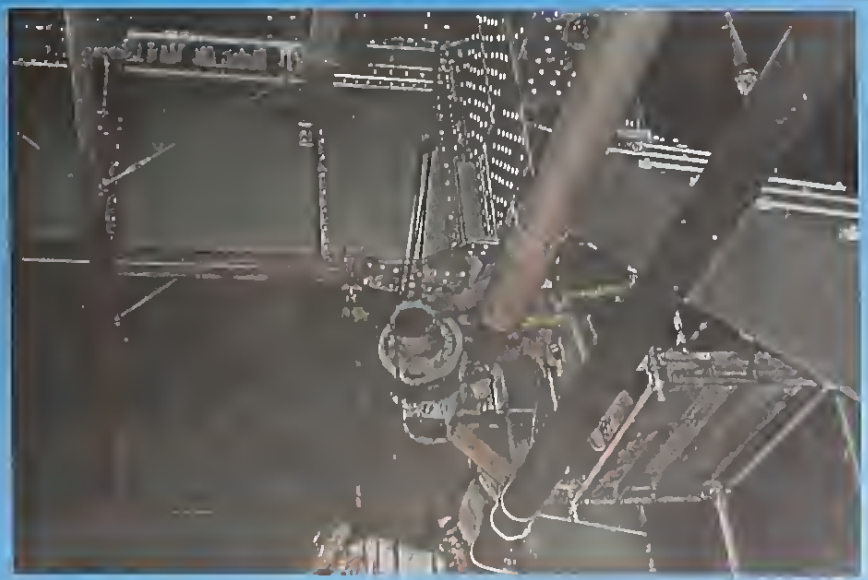


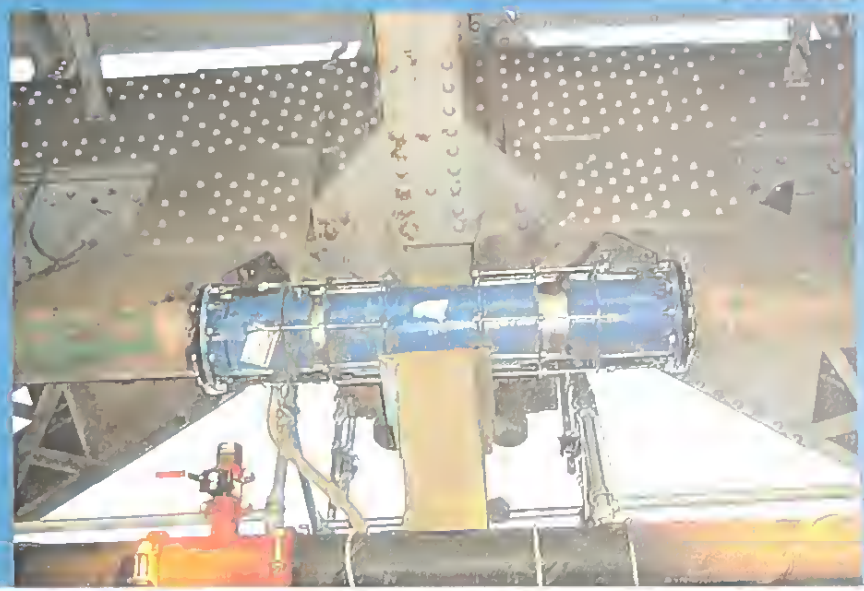


Lombard Reservoir – Drilling for Inclinometer

Bay Bridge Pump Station – Expansion Joint Replacement



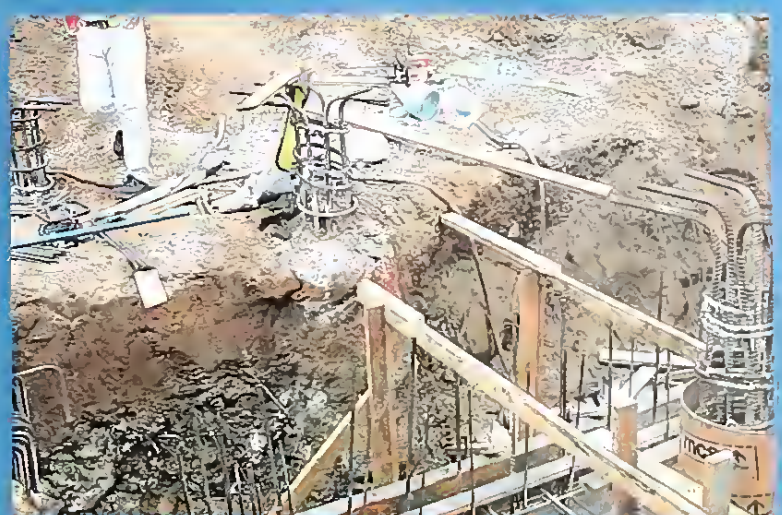
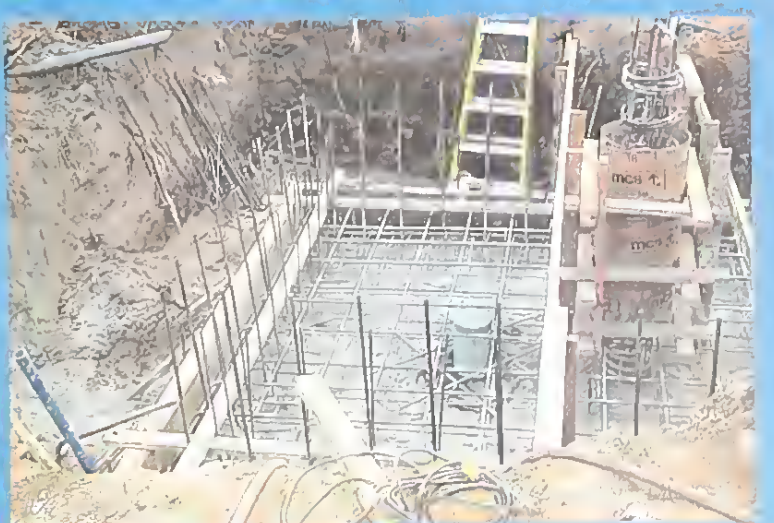




Sutro Improvements

Drilling

East Wall

North Wall

Forest Hill